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ABSTRACT

This study was designed to: (1) investigate the relationships between internal-external (I-E) locus of control and academic achievement for boys and girls over a nine-month period and (2) to determine whether the moderate ability of I-E scores to predict academic achievement is due to the moderate reliabilities of the I-E measures. A total of 279 third-grade children were tested on I-E control and academic achievement in September and again in May. The I-E control measure used was the Intellectual Achievement Responsibility (IAR) questionnaire which yields one subscore for belief in internal responsibility for success (I+) and one subscore for internal responsibility for failure (I-). The achievement measures used in this study consisted of the reading and arithmetic batteries of the California Tests of Basic Skills. The data were analyzed using two sets of canonical correlations: the first set testing the ability of the observed I-E scores to predict later achievement, and the second set testing the ability of these I-E scores statistically corrected for measurement error to predict the same achievement scores. The comparison of these two analyses revealed that improvements in measures of the I-E trait could result in an important predictor of academic performance for boys. (JMB)

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SEX DIFFERENCES IN PREDICTABILITY OF ACADEMIC ACHIEVEMENT FROM INTERNAL-EXTERNAL CONTROL

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Abstract

The purpose of this study was two-fold: First, to further investigate the relationships between internal-external (I-E) locus of control and academic achievement for each sex and to trace developmental trends in the relationships over a nine-month period; and second, to determine whether, with perfectly reliable measures of the I-E control trait, prediction of academic achievement would be greatly improved for either sex. A longitudinal sample of third graders (N=279) was used. Both problems were investigated using canonical correlation analyses: problem 1, based on observed scores; problem 2, on estimated true score correlation matrices obtained utilizing a multivariate correction for attenuation. The predictor set in these analyses consisted of the IAR I+ and I- subscales; the criterion set was composed of the CTBS reading and arithmetic battery subtests.

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PROBLEM

Rotter (1954, 1966) developed from social learning theory a concept of internal-external control of reinforcement which describes the extent to which individuals differ in their belief that they are able to influence or control the outcomes of their behaviors in learning situations. Individuals who believe that reinforcements are contingent upon their own behavior, capacities or attributes are referred to as "internals"; those who believe that reinforcements are not under their personal control but rather under the control of fate, chance, luck, powerful others, etc., as "externals."

Rotter (1966) saw as a logical extension of the concept of internal-external (I-E) control that "those at the internal end of the scale would show more overt striving for achievement than those who felt they had little control over their environment" (p. 21). In other words, if individuals are convinced that they have little control over their successes or failures in the achievement realm, then they have little reason to modify their behavior in an attempt to increase the probability of success. Conversely, individuals who feel responsible for their successes and failures should show greater initiative and persistence in learning situations.

The principal investigations of the predictive utility of I-E control to measures of academic competence have been based on the Intellectual Achievement Responsibility (IAR) questionnaire (Crandall, Katkovsky and Preston, 1962; Crandall, Katkovsky and Crandall, 1965; McGhee and Crandall, 1968). The findings of these latter investigations have been equivocal, particularly in sex differences in the predictive relationships found in

young children (i.e., elementary school age). Lefcourt (1966) and Joe (1971) have both emphasized the need for more investigations of the sex differences in the relationship between I-E control and achievement-related variables.

The purpose of this study was two-fold: First, to further investigate the predictive relationships between I-E control and academic achievement for each sex and to trace developmental trends in the relationships over a nine-month period; and second, to determine whether, with perfectly reliable measures of the I-E control trait, prediction of academic achievement would be greatly improved for either sex. Underlying the second problem is the distinction between latent traits and the scales or tests constructed to measure the traits. Measures contain error, and hence, the correlation between any constructed measures is less than the correlation between the traits. If, however, it can be presumed that the true scores on the measures can be taken to be reasonable approximations to those on the traits in question, then corrections for attenuation can be used to compute the true correlations among the traits (Lord and Novick, 1968, p. 69). The second problem of this study was to determine whether the moderate predictions found in the past were due to the moderate reliabilities of the I-E measures or whether, even with perfectly reliable measures of the I-E control trait, prediction of academic achievement would not be greatly improved for either sex.

PROCEDURES

Sample

A longitudinal sample of third graders was selected for this study. The longitudinal investigation extended for a nine-month period from September to May. A total of 30 third grade self-contained classrooms were randomly selected from a population consisting of 40 third grade classrooms

in a public school system located in a suburban community of Massachusetts. A 50 percent sample of pupils stratified on sex was then randomly selected from each classroom. At the end of grade 3, the total sample included 149 boys and 130 girls.

Instruments

The I-E control measure used in this study was the Intellectual Achievement Responsibility (IAR) questionnaire. This measure yields two separate subscores, one for belief in internal responsibility for successes (I+), the other for internal responsibility for failures (I-). Unlike many of the more general measures of the internal-external construct in use, the IAR was devised to assess beliefs in internal-external responsibility for reinforcements exclusively in intellectual-academic achievement tasks and situations. MacDonald (1973) commented in a review of measures of the internal-external locus of control that the IAR has been carefully developed, has an abundant literature of studies in which it has been used, and has quite acceptable psychometric properties.

The achievement measures used in this study consisted of the reading and arithmetic batteries of the California Tests of Basic Skills (Form R, Level 1). The reading battery provides two separate subtest scores (vocabulary and comprehension); the arithmetic battery, three separate subtest scores (computation, concepts, and application).

Data Collection

Both the IAR and the CTBS were administered by specially trained outside examiners in September, 1974 and readministered in May, 1975. The IAR was individually administered orally to each child in the 50% probability sample; the CTBS was group administered to each classroom as a whole. The questions on the IAR were tape recorded so that each child was presented verbal stimuli

which had the same inflections, tone and rate. The CTBS reading and arithmetic batteries were administered on two consecutive days using the standard instructions provided by the CTBS Examiner's Manual, with the exception of changes in the time limits for each of the subtests. Since it was believed the relationship of I-E control with achievement could be more appropriately measured under power test conditions, the time limits specified by the CTBS Examiner's Manual were increased by 20 percent.

Statistical Analyses

Past investigations of the predictive relationship of the IAR with achievement measures have been based on bivariate regressions (Crandall, Katkovsky and Preston, 1962) or univariate analyses of variance (McGhee and Crandall, 1968). In the latter case children were classified as high or low internals on the basis of a median split on each of the IAR subscales for for each sex by grade. If in fact the I-E control trait has a continuous dis- distribution as assumed by Rotter's theory, then the latter approach which presumes the trait is dichotomous could mask relationships between the IAR subscales and achievement measures. This investigation assumed the I-E trait has a continuous distribution and based its analyses on regressions involving the total score range for the IAR subscales.

In addition, a multivariate approach to investigating the relationships was used. Canonical correlation analyses were performed for each of the two time points by sex. For the first problem, the predictor set in each of the four analyses consisted of the observed scores for the I+ and I- subscales; the criterion set was composed of the observed scores for the five reading and arithmetic achievement subtests. Preliminary to the canonical correlation analyses, the parallelism of the regression planes (i.e., the I+ and I- subscales

regressed on the five achievement subtests) for each sex for the two time points was tested. For the second problem, the canonical correlation analyses were performed on the estimated true score correlation matrices which were obtained utilizing the multivariate correction for attenuation procedures outlined by Bock and Petersen (1975).

Past studies had reported low correlations between the I+ and I- subscales which suggested that assuming responsibility for academic successes may be different from assuming responsibility for academic failures. By including each of the I+ and I- subscales in the predictor set in the canonical analyses, it was possible to determine whether in fact these subscales are measuring distinct factors in achievement and the relative importance of each. In addition, past studies have looked at the relationship of these subscales with total achievement battery scores. By including the subtests (which are highly reliable) for each of the reading and arithmetic batteries, it was possible to determine how consistent the relationship is across the subtests within each battery.

SUMMARY OF FINDINGS

Problem 1

Although significant canonical correlations were found for each sex at the beginning and end of grade 3, the proportion of variation (redundancy index) in the criterion achievement measures predicted by the I+ and I- subscales in each analysis was extremely low, ranging from 2.24-3.94%. The relationships underlying the significant roots are summarized below for each sex.

Different prediction patterns were found for boys than those reported by Crandall, Katkovsky and Preston (1962) and McGhee and Crandall (1968). Although the latter investigation found the relationship in boys limited to the I-

subscale, it was the I+ subscale which was consistently related in this investigation to the achievement measures at the beginning and end of grade 3, with the I- subscale showing only a low relationship at the beginning of grade 3 and essentially a zero relationship at the end of grade 3. In addition, although both the latter investigations found the relationship confined to reading achievement, this investigation found the relationship applied to both reading and arithmetic, with the relationship to reading becoming stronger over the nine-month period and the relationship to the arithmetic subtests varying considerably.

In contrast, highly congruent prediction patterns to those reported by McGhee and Crandall (1968) were found for girls. Both the I+ and I- subscales were found to be predictive of all five reading and mathematics achievement subtests across the nine-month period, with the I+ and I- subscales becoming more equally predictive by the end of grade 3.

The most noteworthy difference between the relationships found for each sex is that by the end of grade 3 only the I+ subscale was predictive of achievement performance for boys while both the I+ and I- subscales were equally predictive for girls. Past studies had suggested that a boy's belief that he is responsible for his academic failures might constitute a greater incentive to academic effort than a similar orientation with respect to his successes (McGhee and Crandall, 1968). This investigation suggests that the opposite may be true with boys at the end of grade 3.

Problem 2

The canonical correlation analyses based on true scores showed that there was considerably more room for improvement in the prediction of academic performance from I-E control for boys than for girls. This

conclusion was based on comparisons of a redundancy index of the proportion of variance in the criterion achievement measures predictable from the predictor I subscales (or equivalently, the redundancy in the criterion set given the predictor set) and not on the total proportion of variance shared by the linear composites of the two sets (Stewart and Love, 1968). At the beginning of grade 3, the proportion of variance in the criterion achievement measures predictable from the I subscales increased from 2.24% to 18.73% for boys and from 3.94% to only 7.07% for girls. At the end of grade 3, the proportion of predictable variance increased from 3.01% to 28.31% for boys and from 2.76% to only 6.79% for girls. Thus, it can be concluded from these analyses that improvements in measures of the I-E trait could result in an important predictor of academic performance for boys.

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